REMARKS

Claim Rejections

Claims 1-9 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-20 of copending application no. 10/076,289, in view of Pelrine (U.S. 5,099,216). Claims 1-18 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-20 of copending application no. 10.076,289 in view of Pelrine, Aiura (EP 951960) and Sakata et al. (U.S. 4,561,185). Claims 1-5, 8 and 9 are rejected under 35 U.S.C. §103(a) as being unpatentable over Lorincz et al. (U.S. 5,958,195) in view of Pelrine. Claims 6 and 7 are rejected under 35 U.S.C. §103(a) as being unpatentable over Lorincz et al. in view of Pelrine, and further in view of Lin et al. (U.S. 2003/98245). Claims 10-18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Lorincz et al. in view of Pelrine, and further in view of Aiura et al. and Sakata et al.

Drawings

Applicant proposes to amend Figure 1 as illustrated in red on the attached photocopy. In Figure 1, it is proposed to correct the label "22" to read --29--. No "new matter" has been added to the original disclosure by the proposed amendment to this figure. It is believed that the foregoing proposed amendment obviates the outstanding objections to the drawings. Approval of the proposed drawing change is respectfully requested.

Abstract of the Disclosure

Applicant is submitting an substitute Abstract of the Disclosure for that originally filed with this application to more clearly describe the claimed invention. Entry of the substitute Abstract of the Disclosure is respectfully requested.

Substitute Specification

As required by the Examiner, a Substitute Specification is enclosed, along with a marked-up copy of the original specification indicating the changes made

thereto by the Substitute Specification. No "new matter" has been added to the original disclosure by the Substitute Specification. Entry of the Substitute Specification is respectfully requested.

Double Patenting

Applicant respectfully traverses the rejection of claims 6 and 7 as being rendered obvious by Lorincz et al. taken in view of Pelrine and further in view of Lin et al. (U.S. 2003/0098245). Applicant submits that Lin et al. is not "prior art" under any section of 35 U.S.C. §102 with respect to the instant application. 35 U.S.C. §102 (e)(1) requires that a published application be "...by another filed in the United States before the invention by the Applicant for a patent." Applicant notes that the published application to Lin et al. was not filed in the United States until February 19, 2002, a date that is subsequent to the Applicant's date of invention on the record of this application, which is Applicant's priority date of December 13, 2001. In the instant application, Applicant has perfected the claim to priority by filing a certified copy of Taiwan application no. 090221767. Thus, it is believed to be quite evident that Lin et al. is not "prior art" under 35 U.S.C. § 102 and, therefore, cannot be used as prior art in a rejection made under 35 U.S.C. § 103. The outstanding rejection of claims 6 and 7 as being rendered obvious by Lorincz taken in view of Pelrine and Lin et al. is respectfully traversed. Lin et al. and the instant invention were subject to common ownership at the time of invention.

New Claims

By this Amendment, Applicant has canceled claims 1-18 and has added new claims 19-35 to this application. It is believed that the new claims specifically set forth each element of Applicant's invention in full compliance with 35 U.S.C. § 112, and define subject matter that is patentably distinguishable over the cited prior art, taken individually or in combination.

The new claims 19-26 recite an electropolishing device for electropolishing an inner surface of a long tube comprising: a fixed magnet mechanism having a plurality of fixed magnets, each of the plurality of fixed magnets positioned with a long side parallel with an axis of the long tube; first and second partitions located

such that the fixed magnet mechanism is located between and axially aligned with the first and the second partitions; a cable connected to a first power supply; at least one electrode connected at a first end to the cable and at a second end to the first partition, the at least one electrode located in an interior of the long tube, the cable providing a direct current to the at least one electrode; a driving apparatus connected to a second power supply and having a plurality of outer electromagnets positioned around an outer periphery of the tube, the plurality of outer magnets generates an electromagnetic force that positions the electrode within the tube and rotates the fixed magnet mechanism and the first and the second partitions on the axis of the tube; and an axial driven mechanism moves the driving apparatus along the axis of the tube, the axial movement of the driving apparatus and the rotation of the fixed magnet mechanism and the first and the second partitions are performed simultaneously, such that a flow of an electrolyte and the movement of the electrode through the tube electropolishes the inner surface of the long tube.

Other embodiments of claims 19-26 include: the plurality of partitions are made of a material without electric conductivity; each of the partitions have a plurality of slots formed on an outer periphery, the electrolyte flows between the plurality of slots and the inner surface of the long tube; each of the partitions have a plurality of holes through which the electrolyte flows; a screw structure connected to the second partition opposite the fixed magnet mechanism; the screw structure is selected from the group consisting of a propeller and a screw slideway; the driving apparatus is an electromagnet apparatus, the plurality of outer electromagnets are driven and the plurality of fixed magnets are rotated when the driving apparatus is connected to the second power supply; and the driving apparatus is an rotational apparatus, the plurality of outer electromagnets are driven by a direct mechanical transmission and the plurality of fixed magnets are rotated when the driving apparatus is connected to the second power supply.

New claim 27 modifies the second portion of claim 19 to include: a plurality of closed fillisters spaced apart on an outer periphery of the second partition, each of the plurality of fillisters having a flexible element and a protruding object with an abrasive, the abrasive of the protruding object extending outwardly beyond the outer

periphery of the second partition and contacting the inner surface of the long tube for grinding.

Other embodiments of claims 28-35, which depend from claim 27 include: the flexible element is a spring; the protruding object is a thimble; the abrasive is made of Al_2O_3.

The primary reference to Lorincz et al. discloses a tube inner surface electropolishing device including a flexible electrode (18) inserted into a tube (14). The flexible electrode includes an electric cable (80), a plurality of star-shaped insulators (604), and a plurality of electrodes (512).

On page 9 of the outstanding Office Action, the Examiner admits that "Lorincz et al. do not teach a fixed magnet mechanism attached to the electrode and placed between two of the partitions, nor a driving apparatus having a plural outer electromagnets nor an axial drive mechanism for moving the driving apparatus." On page 11 of the outstanding Office Action, the Examiner admits that Lorincz et al. "do not teach that there is a screw mechanism attached on an end of the electrode assembly for removing air bubbles." On page 12 of the outstanding Office Action, the Examiner admits that Lorincz et al. "do not teach plural closed fillisters being placed on the second partition, wherein the fillister includes a flexible element and a protruding object supporting an abrasive for grinding the inner surface."

Lorincz et al. do not teach a fixed magnet mechanism having a plurality of fixed magnets, each of the plurality of fixed magnets positioned with a long side parallel with an axis of the tube; a driving apparatus connected to a second power supply and having a plurality of outer electromagnets positioned around an outer periphery of the tube, the plurality of outer magnets generates an electromagnetic force that positions the electrode within the tube and rotates the fixed magnet mechanism and the first and the second partitions on the axis of the tube; nor do Lorincz et al. teach the axial movement of the driving apparatus and the rotation of the fixed magnet mechanism and the first and the second partitions are performed simultaneously.

The secondary reference to Pelrine teaches a magnetically levitated apparatus including electrode magnets (12), a manipulator (14), a programmable control means (82), a precision work space (16), and a process material (18). The

electrode magnets include a top set of electrode magnets (22) and a bottom set of electrode magnets (26).

On page 11 of the outstanding Office Action, the Examiner admits that Pelrine does "not teach that there is a screw mechanism attached on an end of the electrode assembly for removing air bubbles." On page 12 of the outstanding Office Action, the Examiner admits that Lorincz et al. does "not teach plural closed fillisters being placed on the second partition, wherein the fillister includes a flexible element and a protruding object supporting an abrasive for grinding the inner surface."

Pelrine does not teach a fixed magnet mechanism having a plurality of fixed magnets, each of the plurality of fixed magnets positioned with a long side parallel with an axis of the tube; at least two partitions including first and second partitions, the fixed magnet mechanism located between and axially aligned with the first and the second partitions; a cable connected to a first power supply; at least one electrode connected at a first end to the cable and at a second end to the first partition, the at least one electrode located in an interior of the long tube, the cable providing a direct current to the at least one electrode; a driving apparatus connected to a second power supply and having a plurality of outer electromagnets positioned around an outer periphery of the tube, the plurality of outer magnets generates an electromagnetic force that positions the electrode within the tube and rotates the fixed magnet mechanism and the first and the second partitions on the axis of the tube; nor does Pelrine teach an axial driven mechanism moves the driving apparatus along the axis of the tube, the axial movement of the driving apparatus and the rotation of the fixed magnet mechanism and the first and the second partitions are performed simultaneously.

The secondary reference to Aiura discloses an apparatus for polishing an inner surface for a cylindrical work piece including a fixed chuck (13) for fixing a long sized cylindrical work piece (W), electrodes (35, 36), a holder (39) positioned within openings in the electrodes, and elastic grind stones (37, 38) positioned within the holders.

Aiura does not teach a fixed magnet mechanism having a plurality of fixed magnets, each of the plurality of fixed magnets positioned with a long side parallel with an axis of the tube; at least two partitions including first and second partitions,

the fixed magnet mechanism located between and axially aligned with the first and the second partitions; nor does Aiura teach a screw structure connected to the second partition opposite the fixed magnet mechanism; the screw structure is selected from the group consisting of a propeller and a screw slideway.

Aiura teaches a fixed chuck for holding a cylindrical work piece, but does not teach a driving apparatus connected to a second power supply and having a plurality of outer electromagnets positioned around an outer periphery of the tube, the plurality of outer magnets generates an electromagnetic force that positions the electrode within the tube and rotates the fixed magnet mechanism and the first and the second partitions on the axis of the tube;

Aiura teaches an elastic grind stone extending from an electrode, but does not teach a plurality of closed fillisters spaced apart on an outer periphery of the second partition, each of the plurality of fillisters having a flexible element and a protruding object with an abrasive, the abrasive of the protruding object extending outwardly beyond the outer periphery of the second partition and contacting the inner surface of the long tube for grinding.

The secondary reference to Sakata et al. discloses a measuring instrument including an outer tube (72) with a spring retaining groove (77), a cylindrical thimble (76) positioned on an outer periphery of the outer tube, and a right-handed rotation coil spring (78) for providing a constant pressure between the outer tube and the cylindrical thimble.

Sakata et al. does not teach a fixed magnet mechanism having a plurality of fixed magnets, each of the plurality of fixed magnets positioned with a long side parallel with an axis of the tube; at least two partitions including first and second partitions, the fixed magnet mechanism located between and axially aligned with the first and the second partitions; at least one electrode connected at a first end to the cable and at a second end to the first partition, the at least one electrode located in an interior of the long tube, the cable providing a direct current to the at least one electrode; a driving apparatus connected to a second power supply and having a plurality of outer electromagnets positioned around an outer periphery of the tube, the plurality of outer magnets generates an electromagnetic force that positions the electrode within the tube and rotates the fixed magnet mechanism and the first and

the second partitions on the axis of the tube; an axial driven mechanism moves the driving apparatus along the axis of the tube; a screw structure connected to the second partition opposite the fixed magnet mechanism; nor does Sakata et al. teach the screw structure is selected from the group consisting of a propeller and a screw slideway.

Sakata et al. teaches a coil spring (78) pressing against an outer tube (72) and a thimble (76), but does not teach a plurality of closed fillisters spaced apart on an outer periphery of the second partition, each of the plurality of fillisters having a flexible element and a protruding object with an abrasive, the abrasive of the protruding object extending outwardly beyond the outer periphery of the second partition and contacting the inner surface of the long tube for grinding.

Even if the teachings of Lorincz et al., Pelrine, Aiura, and Sakata et al. were combined, as suggested by the Examiner, the resultant combination does not suggest: 1) a fixed magnet mechanism having a plurality of fixed magnets, each of the plurality of fixed magnets positioned with a long side parallel with an axis of the tube; 2) a driving apparatus connected to a second power supply and having a plurality of outer electromagnets positioned around an outer periphery of the tube; 3) a screw structure connected to the second partition opposite the fixed magnet mechanism; 4) the screw structure is selected from the group consisting of a propeller and a screw slideway; nor does the combination suggest 5) a plurality of closed fillisters spaced apart on an outer periphery of the second partition, each of the plurality of fillisters having a flexible element and a protruding object with an abrasive.

It is a basic principle of U.S. patent law that it is improper to arbitrarily pick and choose prior art patents and combine selected portions of the selected patents on the basis of Applicant's disclosure to create a hypothetical combination which allegedly renders a claim obvious, unless there is some direction in the selected prior art patents to combine the selected teachings in a manner so as to negate the patentability of the claimed subject matter. This principle was enunciated over 40 years ago by the Court of Customs and Patent Appeals in In re Rothermel and Waddell, 125 USPQ 328 (CCPA 1960) wherein the court stated, at page 331:

> The examiner and the board in rejecting the appealed claims did so by what appears to us to be a piecemeal reconstruction of the prior art patents in the light of appellants' disclosure. ... It is easy now to attribute to this prior art the knowledge which was first made available by appellants and then to assume that it would have been obvious to one having the ordinary skill in the art to make these suggested reconstructions. While such a reconstruction of the art may be an alluring way to rationalize a rejection of the claims, it is not the type of rejection which the statute authorizes.

The same conclusion was later reached by the Court of Appeals for the Federal Circuit in Orthopedic Equipment Company Inc. v. United States, 217 USPQ 193 (Fed.Cir. 1983). In that decision, the court stated, at page 199:

> As has been previously explained, the available art shows each of the elements of the claims in suit. Armed with this information, would it then be non-obvious to this person of ordinary skill in the art to coordinate these elements in the same manner as the claims in suit? The difficulty which attaches to all honest attempts to answer this question can be attributed to the strong temptation to rely on hindsight while undertaking this evaluation. It is wrong to use the patent in suit as a guide through the maze of prior art references, combining the right references in the right way so as to achieve the result of the claims in suit. Monday morning quarterbacking is quite improper when resolving the question of non-obviousness in a court of law.

In In re Geiger, 2 USPQ2d, 1276 (Fed.Cir. 1987) the court stated, at page 1278:

> We agree with appellant that the PTO has failed to establish a *prima facie* case of obviousness. Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching suggestion or incentive supporting the combination.

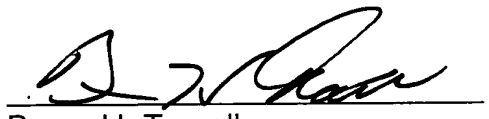
Applicant submits that there is not the slightest suggestion in either Lorincz et al., Pelrine, Aiura, or Sakata et al. that their respective teachings may be combined as suggested by the Examiner. Case law is clear that, absent any such teaching or suggestion in the prior art, such a combination cannot be made under 35 U.S.C. § 103.

Neither Lorincz et al., Pelrine, Aiura, nor Sakata et al. disclose, or suggest a modification of their specifically disclosed structures that would lead one having ordinary skill in the art to arrive at Applicant's claimed structure. Applicant hereby respectfully submits that no combination of the cited prior art renders obvious Applicant's new claims.

Summary

In view of the foregoing amendments and remarks, Applicant submits that this application is now in condition for allowance and such action is respectfully requested. Should any points remain in issue, which the Examiner feels could best be resolved by either a personal or a telephone interview, it is urged that Applicant's local attorney be contacted at the exchange listed below.

Respectfully submitted,

Date: January 2, 2004 By: 

Bruce H. Troxell
Reg. No. 26,592

TROXELL LAW OFFICE PLLC
5205 Leesburg Pike, Suite 1404
Falls Church, Virginia 22041
Telephone: 703 575-2711
Telefax: 703 575-2707

ANNOTATED MARKED-UP DRAWING

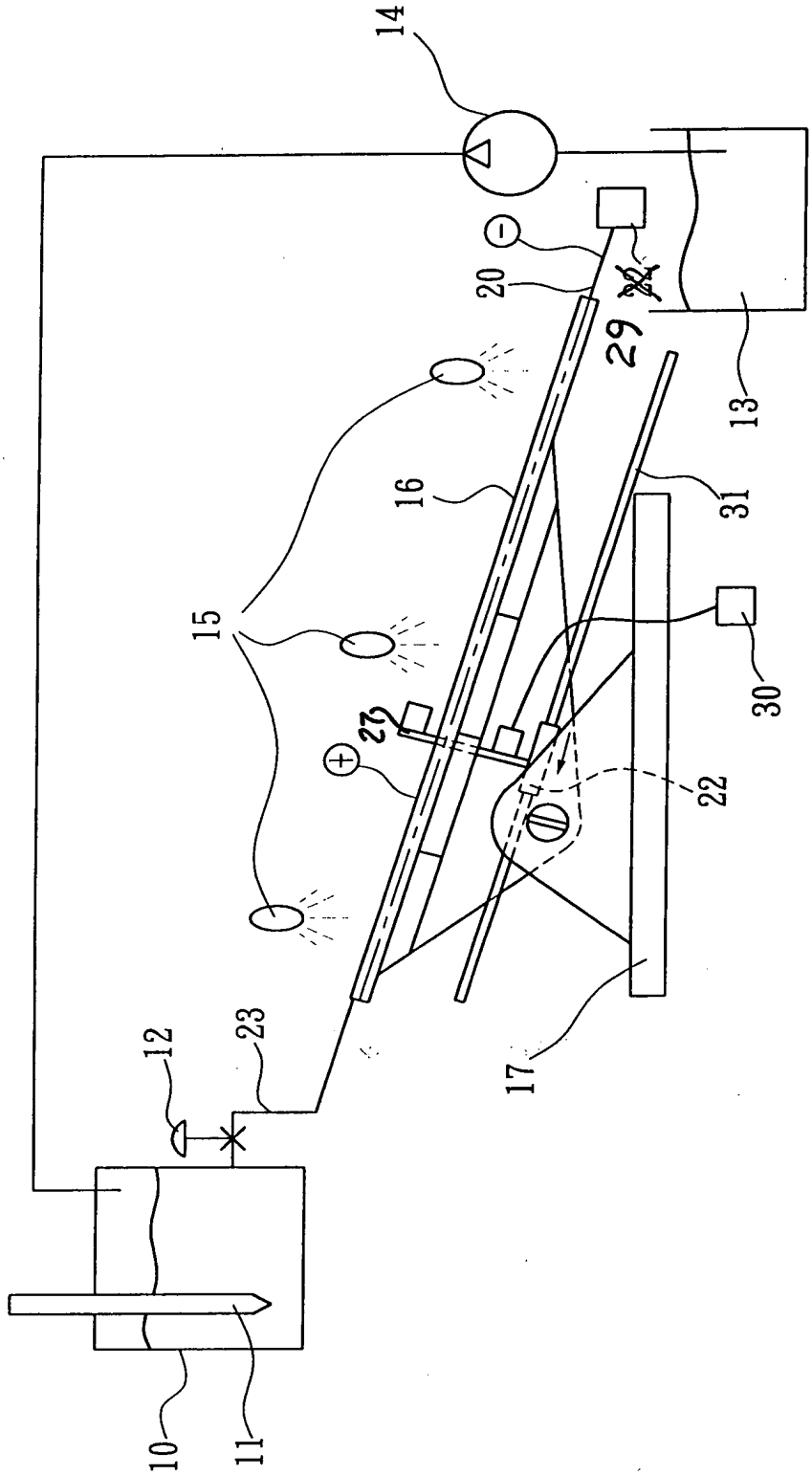


FIG. 1

SUBSTITUTE SPEC
10/085,074

AN ELECTROPOLISH/GRINDING ~~MEANS~~ FOR AN INNER SURFACE OF A LONG TUBE

1. Field of the Invention

[0001] The present invention is an electropolish/grinding ~~means~~ for an inner surface of a long tube, especially applied to a long tube of greater than 3 meters long and a diameter range under 5 cm.

2. Background of the Invention

[0002] A process of electropolish is to connect a workpiece to an anode and a metal to a cathode, ~~aforesaid~~ whole structure ~~of~~ workpiece ~~connecting to anode and metal connecting to cathode are~~ put into electrolyte ~~for electrifying~~ direct current, ~~thus~~ defects on workpiece surface are removed and the surface is then ~~shining~~ and smooth. Features of electropolish are ~~that~~ improving surface cleanness, roughness, passivation, etc. For different fields of semiconductor, chemical industry, biochemical engineering, foodstuff industry, ~~needed~~ tubes ~~of aforesaid fields~~ are to deliver fluids of those fields, and inner surfaces of tubes are treated by polish or electrolysis ~~to approach high cleanness~~ and anti-corrosion. Especially, products of IC/LCD/III-V require high standards of cleanness and anti-corrosion, ~~thus, applying the present invention to said products are a challenge.~~

[0003] In prior arts of US Patent No. 4826582 and 4849084, which ~~are figuring out part of the technologies of~~ electropolish a 10-meter heat exchange tube, ~~and~~ an electrode device for positioning workpiece and sealing electrolyte ~~is a must~~. The prior arts adopt a 3-layer structure ~~of~~ delivering electrolyte ~~of~~ with high pressure air, but ~~unfortunately~~ said structure is ~~very complicate~~ and only suitable for bigger diameter workpieces, not for diameters under 3 cm.

[0004] ~~In~~ prior art of US Patent Number 5958195, ~~which is~~ the technology of electrolyzing and polishing an inner surface of a long and bended tube. However, to electrolyze and polish a bended tube, electrode

must move alone a bended curve for not happening short circuit. The most important parts are a flexible electrode and an insulation device. The insulation device is to avoid short circuit and non-concentricity, but it blocks electrolyte flowing and makes un-average electric field, etc.

[0005] In prior arts of US Patent Number 4601802 and 4705611, which offer a fixture applied an inside tube, and the fixture stabilizes a plurality of axially rotating tubes simultaneously. An end connector can circulate tube and exhaust gas from an upper end, and electrolyte can be recycled after overflowing. An electrode length is equal to the tube's length, therefore a huge space and a super power supplier are needed to fit such conditions.

[0006] Based on the aforesaid issues, the present inventor of the patent has being studied and referred to practical experiences and theory for designing and effectively improving the prior arts.

Summary of the Invention

[0007] The first object is to offer an electropolishing/grinding means for an inner surface of a long tube, which improves an electrode design and applies a theory of huge and fine polishing to a same electrode means for improving a successful rate in manufacturing and an electropolish surface and passivation effect.

[0008] The second object is to offer an electropolishing/grinding means for an inner surface of a long tube, which can electrolyze and polish an inner surface of a tube greater than 3 meters and diameter range under 5 cm; a structure of the means is simple to save an equipment cost.

[0009] The third object is to offer an electropolishing/grinding means for an inner surface of a long tube, which avoids short circuit and non-concentricity problems. An electrode of the present invention is installed through a center of a partition, so the electrode has a certain distance with the inner surface in tube because the partition supports electrode. Therefore, the short circuit and non-concentricity are solved; further, the average electric field is kept all the time because of the partition is round.

[0010] The fourth object is to offer an electropolishing/grinding means

that includes a multi-sectioned electrode.

for an inner surface of a long tube, ~~which electrode can be designed as multi-section, to do so figures out that needing a huge space to store such similar equipment, further,~~ the electrode can be added in different sections depending on needs to improve electropolish result, and to reduce storage space.

[0011] The appended drawings will provide further illustration of the present invention, together with description; serve to explain the principles of the invention.

Brief Description of the Drawings

[0012] Figure 1 is a scheme of a practical application of the present invention.

[0013] Figure 2 is a first preferred embodiment of the present invention.

[0014] Figure 3 is a preferred embodiment of a partition of the present invention.

[0015] Figure 4 is a scheme of a practical application of the present invention.

[0016] Figure 5 is a partial enlarged view of a preferred embodiment of a long tube of the present invention.

[0017] Figure 6 is a sectional view of a preferred embodiment of the partition of the present invention.

[0018] Figure 7 is a preferred embodiment of the long tube of the present invention.

Detailed Description of the Present Invention

[0019] ~~For~~ different fields of semiconductor, chemical industry, biochemical engineering, foodstuff industry require inner surfaces of ~~needed~~ tubes ~~of aforesaid fields are~~ be treated by electrolyzing and polishing ~~for improving~~ to improve surface cleanness, roughness and passivation results. The present invention comprises an electrolyte delivering system, which makes electrolyte ~~averagely~~ uniformly

pass through an inner surface of a long tube; a cable, which guides direct current to a working area of an inner surface of tube, and electrolyte is an electrifying media to make a complete electric path, wherein a magnetic-levitated device can be added on, which drives electrode axial motion and revolving motion, further to avoid a contact of a negative electrode and the positive inner surface. Plural places of radial top of the partition are installed some abrasive blocks such as Al_2O_3, etc.; and the abrasive blocks cooperates with plural closed fillisters, springs and thimbles for constantly keeping the abrasive blocks onto the inner surface, results of grinding and electropolishing are then achieved.

[0020] Referring to figure 1, which is a scheme of a practical application of the present invention. Electrolyte is stored in a tank 10. There is a heater 11 in the tank 10 to keep warming and heating the electrolyte. Electrolyte passes through a switch 12 and a pipe 23 to a tube 16, wherein the switch 12 is made of Teflon or other heat-resistant and acid-proof materials. The tube 16 is placed on an inclined platform 17, and thus a higher end of tube 16 connects to the pipe 23 for electrolyte passing from higher end to a lower end. Inclined angles of the inclined platform 17 can be adjusted to control electrolyte flowing speeds. Tube 16 has an electropolishing device inside, which connects to a first power device 29 via a cable 20; the first power device 29 supplies direct current for electropolishing reaction. The present invention adopts that electron exchanging from an anode half reaction and a cathode half reaction to generate an electropolishing result. Tube 16 is anode, thus an inner surface of tube 16 is anode, and anode looses electrons, the electrode is cathode, and cathode receives electrons. figure 1 does not show the electrode, so only cable 20 is shown up to represent above connection relationship. Tube 16 is about 2 meters long or more than that, so electrolyte temperature is lower when electrolytes approaching to a lowest end of tube 16, thus plural halogen bulbs 15 are placed around tube 16 for heating. Electrolyte is recycled after passing through tube 16 to a reocycling tank 13, then it is delivered back to tank 10 by a pump 14 with heat-resistant and acid-proof. A driving apparatus 27 is set surround tube 16 and has several outer electromagnets inside (not shown in figure); when the outer electromagnets cooperating with a second power device 30, generating electromagnetic to associate with plural fixed magnets for revolving the fixed magnets, thus the electropolishing device in tube 16 is in rotating motion. An axial driven mechanism 22 carries the driving

apparatus 27 and ~~mounts~~ is mounted on a guiding rod mechanism 31; ~~Cooperation of~~ the axial driven mechanism 22 ~~and~~ moves the guiding rod mechanism 31 ~~is thus~~ to move the driving apparatus 27 ~~which~~ parallel to the tube 16. ~~For the~~ In one embodiment, axial driven mechanism 22 moves from lower position to higher position when electropolishing ~~reaction being~~ reaction is ~~processed for~~ thereby exhausting air ~~bulbs~~ bubbles generated by the reaction. ~~As aforesaid, which is a~~ The complete process ~~and~~ will be described in detail ~~as following~~ below.

[0021] Referring to figure 2, which is a first preferred embodiment of the present invention. ~~The~~ This embodiment ~~applies to polish~~ relates to polishing an inner surface of the tube 16, which is longer than 3 meters and made of SUS300 series without polarization. The embodiment comprises a fixed magnet mechanism 28 including ~~a plural~~ the plurality of fixed magnets 281, which ~~adopt axial~~ are positioned with the longest sides ~~of themselves for being~~ located axially and combined and formed ~~to become~~ as the fixed magnet mechanism 28; at least one electrode 21, which is made of copper and ~~wolfram~~ tungsten, an end of the electrode 21 is bounded a cable 20, which connects to a first power device 29 outside of the tube 16 for power supply; at least two partitions, which ~~is~~ are made of Teflon or materials without electric conductivity for limiting electropolishing range, and ~~it is~~ to save power and ~~enhancing~~ enhance electropolishing result. Please refer to figure 3, which is a preferred embodiment of a partition of the present invention, including a plurality of ~~plural~~ slots 25 ~~are~~ designed on an outer edge of the partition; the slots make electrolyte flow close to an inner surface more fluently; a boundary layer is ~~then~~ broken to generate an average anode membrane, thus air ~~bulbs~~ bubbles generated by electropolishing are exhausted fast; further, the partitions 18 and 26 ~~has~~ have many holes as meshes for fluently introducing electrolyte, to avoid contact of negative electrode 21 and positive inner surface and figure out non-average polishing of eccentric electrode, dimensions of the partitions cannot be enlarged; the present invention takes the driving apparatus 27 and the fixed magnet mechanism 28 to form a magnetic levitation effect, which means using magnetic repulsiveness and magnetic attraction to keep ~~away from~~ the partitions ~~and~~ away from the inner surface and avoid the eccentric situation; the first partition 18 is on ~~an~~ a first end of the electrode 21 ~~end~~ opposite ~~another end connecting~~ a second end connected to the cable 20; ~~the second partition 26 is placed on another end of the electrode 21, thus the two ends of~~ the fixed magnet mechanism 28 ~~are individually~~ is between the first partition 18 and the second partition 26; further, the fixed magnet mechanism 28 is radially and ~~averagely~~ uniformly distributed on the two partitions, a surface of the second partition 26

connecting to the fixed magnet mechanism 28 which opposite side is installed a propeller mechanism, and the propeller mechanism can be a propeller or as shown in figure 7, which is a preferred embodiment of the long tube of the present invention, which means a screw slideway 24, and it is to fast remove air bulbs generated from electropolishing reaction, the driving apparatus 27, which comprises plural outer electromagnets 271 distributed around the tube 16, and relative position in the tube 16 is fixed magnet mechanism 28, which connects to the second power device 30 for supplying power to outer electromagnets 271, and the axial driven mechanism 22, which carries both the driving apparatus 27 and the second power device 30 for axially moving aforesaid apparatus and device, the moving speed is from 5 to 20 cm/min. Electrode 21, two partitions 18 and 26 and fixed magnet mechanism 28 are in tube 16, and they cooperate with driving apparatus 27, thus, electromagnet force is going to drive fixed magnets 281 in fixed magnet mechanism 28, therefore electrode 21, two partitions 18 and 26 and fixed magnet mechanism 28 are rotated along their same axis, axial driven mechanism 22 simultaneously drives driving apparatus 27 and second power device 30, and the present invention also moves parallel to the axis, finally when electrode 21 connects to first power device 29, a complete electropolishing reaction in a long tube is done.

[0022] As mentioned above, driving apparatus 27 is an electromagnet apparatus, when driving apparatus 27 connects to second power device 30, plural outer electromagnets 271 are then driven, and plural fixed magnets 281 in fixed magnet mechanism 28 are in rotation as well, which rotation speed is 10 to 200 rpm, on the other hand, driving apparatus 27 is a rotational mechanism, when driving apparatus 27 connects to second power device 30, plural outer electromagnets 271 in driving apparatus 27 are driven via direct mechanical transmission, and plural fixed magnets 281 in fixed magnet mechanism 28 are in rotation as well.

[0023] Please refer to figure 4, which is a scheme of a practical application of the present invention and a preferred embodiment of electropolishing of the present invention. The embodiment is that placing the electrode on a front place, and a front end of electrode is bounded by cable 20, which connects to first power device 29, when electropolishing action is in moving, axial driven mechanism 22 is also in movie from higher to lower for

exhausting particles generated by polishing.

[0024] Referring to figure 5, which is a partial enlarged view of a preferred embodiment of a long tube of the present invention, which is ~~applied to~~ located in the inner surface of tube 16 full of electrolyte, and tube 16 is made of SUS300 series without polarization and longer than 3 meters; ~~and comprising:~~ The present invention includes the fixed magnet mechanism 28, including plural fixed magnets 281, which ~~adopt axial~~ are axially positioned along the longest sides ~~of themselves for being~~ thereof and combined and formed to become the fixed magnet mechanism 28; at least one electrode 21, which is made of copper and ~~wolfram~~ tungsten, an end of the electrode 21 is bounded a cable 20, which connects to the first power device 29 outside of the tube 16 for power supply; at least two partitions, which ~~is~~ are made of Teflon or materials without electric conductivity for limiting electropolishing range; ~~and it is to save~~ The present invention saves power and ~~enhancing~~ enhances the electropolishing result. Please refer to figure 3, which is a preferred embodiment of ~~a~~ the partition of the present invention, plural slots 25 are designed on an outer edge of the first partition 18, the slots 25 make electrolyte flow close to the inner surface more fluently, a boundary layer is then broken to generate an average anode membrane, thus air bulbs generated by electropolishing are exhausted fast; further as shown in figure 3, the partitions 18 and 26 ~~has~~ have many holes 34 as meshes for fluently introducing electrolyte, to avoid contact of negative electrode 21 and positive inner surface and figure out non-average polishing of eccentric electrode, dimensions of the partition 18 cannot be enlarged; the present invention takes the driving apparatus 27 (not shown in figure 5) and the fixed magnet mechanism 28 to form a magnetic levitation effect, which means using magnetic repulsiveness and magnetic attraction to keep ~~away from~~ away from the partitions and inner surface and avoid the eccentric situation, the first partition 18 is on ~~an~~ a first end of the electrode 21 ~~end~~ opposite ~~another end connecting~~ a second end connected to the cable 20; ~~the second partition 26 is placed on another end of the electrode 21, thus the two ends of~~ the fixed magnet mechanism 28 ~~are individually~~ is between the first partition 18 and the second partition 26; further, the fixed magnet mechanism 28 is radially and averagely distributed on the two partitions; referring to figure 6, which is a sectional view of a preferred embodiment of the partition of the present invention, there are ~~plural~~ a plurality of closed fillisters placed on a radial end of the second partition 26, and each of the closed ~~fillister~~ fillisters has a spring 33 and a thimble 35. The thimble 35 protrudes outside the radial end and supports an abrasive device 32 made of Al_2O_3, and the abrasive device 32 continuously ~~supports~~ presses against the inner surface of tube for

grinding. Following components of the present embodiment can be same as figure 2, which comprises the driving apparatus 27, ~~including~~ the plurality of plural outer electromagnets 271 distributed around the tube 16, and ~~relative position~~ positioned in the tube 16 ~~is~~ relative to the fixed magnet mechanism 28, which connects to the second power device 30 for supplying power to outer electromagnets 271; and the axial driven mechanism 22, which carries both the driving apparatus 27 and the second power device 30 for axially moving aforesaid apparatus and device, the moving speed is from 5 to 20 cm/min. Electrode 21, two partitions 18 and 26 and fixed magnet mechanism 28 are in tube 16, and ~~they~~ cooperate with driving apparatus 27, ~~thus~~, The electromagnet force drives the ~~is going to drive~~ fixed magnets 281 in fixed magnet mechanism 28, therefore electrode 21, two partitions 18 and 26 and fixed magnet mechanism 28 are rotated along their same axis. The axial driven mechanism 22 simultaneously drives driving apparatus 27 and second power device 30, ~~and~~ the present invention ~~also~~ moves parallel to the axis of tube 16, ~~finally~~ when electrode 21 ~~connects~~ is connected to first power device 29, a complete electropolishing reaction in a long tube is ~~done~~ performed.

[0025] As mentioned above, the driving apparatus 27 is an electromagnet apparatus, when the driving apparatus 27 connects to second power device 30, the plurality of ~~plural~~ outer electromagnets 271 are then driven, and the plurality of ~~plural~~ fixed magnets 281 in fixed magnet mechanism 28 are ~~in rotation~~ rotated as well, ~~which~~ The rotation speed is 10 to 200 rpm, on the other hand, driving apparatus 27 is a rotational mechanism, when driving apparatus 27 connects to second power device 30, the plurality of ~~plural~~ outer electromagnets 271 in driving apparatus 27 are driven via direct mechanical transmission, and the plurality of ~~plural~~ fixed magnets 281 in fixed magnet mechanism 28 are in rotation as well.

[0026] While the present invention has been shown and described with reference to preferred embodiments thereof, and in terms of the illustrative drawings, it should be not considered as limited thereby. Thus, the present invention is infinitely used. However, various possible modification, omission, and alterations could be conceived of by one skilled in the art to the form and the content of any particular embodiment, without departing from the scope and the sprit of the present invention.

[0027] The invention is disclosed and is intended to be limited only the scope of the appended claims and its equivalent area.